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Changes in Land Use in Western Oregon Between 1971-74 and 1982

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ABSTRACT

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Statistics are presented by county for western Oregon for four dominant land use classes on non-Federally owned land. The classes were primary forest, primary agriculture, low-density urban, and urban. Classes were determined from aerial photographs taken in **1971-74** and in **1982**; by using these data, estimates of change for the period between photography were developed.

Keywords: Land use, land use change, resource use, land allocation, Oregon (western).

SUMMARY

Dominant use classes by county for non-Federal lands in western Oregon are presented. In western Oregon in **1982**, **6.1** million acres were in primary forest use, **3.7** million acres in primary agriculture use, **0.7** million acres in low-density urban use, and **0.4** million acres in urban use. This represents a decrease of **63,000** acres in both primary forest use and primary agriculture, and an increase of **81,000** acres in low-density urban and **45,000** acres in urban use. Change in land use from **1971-74** to **1982** are shown. A map of dominant land use in **1982** is presented.

ADDENDUM

The term "low-density urban" is used in this report to describe a land use condition; also included in the area described is strip development, rural commercial centers, and scattered housing in forested areas. A more comprehensive term is "low-density development."

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IEPTRODUCTION

Most countries seek to maintain a desired balance between land capable of growing crops and land used for habitation and industrial development. In some developing areas, this **is** not yet a problem; in many industrialized countries maintaining a balance between land uses has become an increasingly difficult and frequently divisive problem. The desired balance **is** difficult to determine and subject to continual legislative and public involvement. Decisions that are made are essentially irrevocable; the conversion of land from the growing of crops to other uses generally precludes its being returned to agricultural uses.

Change in the balance of land uses has many ramifications. A shift of land from primarily forested to low-density urban may make many forest management activities more difficult; for example, fire fighting, timber harvesting, vegetation control, and wildlife management. Shifts from land use that **is** primarily agriculture to urban can change existing tax patterns, transportation networks, and demand for educational services.

Benchmark data identifying present land uses are important in deciding how land might best be used. Information on rates of change **is** critical if trends in land use are to be discerned. If both the current status and changes that are taking place in land use are known, future land use patterns can be predicted and evaluated.

Data on land use and rates of change in western Oregon have become available with the completion of recent reinventories (Gedney and others 1986a, 1986b, 1987) of the forest resources of western Oregon by the Forest Inventory and Analysis (FIA) Unit of the Pacific Northwest Research Station: FIA is a nationwide project of the **USA** Forest Service that conducts forest resource inventories throughout the **50** States.

METHODOLOGY

The estimates of area by dominant use class on non-Federal land in western Oregon were developed from a sample-based inventory (Oswald 1984). The sample was a square grid of points located 0.85 miles apart. The points were first located on U.S. Geological Survey quadrangle maps and then transferred to aerial photographs. There are about 24,000 grid points for non-Federal lands in western Oregon. National Forest and Bureau of Land Management areas were excluded from the study. The grid of points covers all other land and water area in western Oregon, **whether forested or not.**

In western Oregon every photo grid point on non-Federal land, **regardless of land use**, was examined, and the current dominant use class was identified on aerial photographs taken in 1982 at a scale of 1:34,000. At the ~~same~~ time, earlier aerial photographs taken in 1971, 1972, and 1974 at a scale of 1:63,000 were examined to determine the dominant use class in the early 1970's.

Each grid point represented 460 acres--an expansion factor developed by dividing the total number of grid points into the 1980 census of land area for western Oregon. Area estimates were developed by summing area weights of the grid points assigned to each dominant use class.

Dominant use classes were identified concurrently by aerial photographs on both the earlier aerial photos and the current aerial photos. Four dominant use classes were identified.

Primary forest--The primary forest class is characterized by large continuous tracts of forested land with little if any area devoted to nonforest development such as farms or housing. To be classed as primary forest, tracts of forest land had to be 640 acres or larger and have no more than eight developments per section (fig. 1). In the primary forest area, a development is any activity not directly related to the management of the forest resource, such as homes or agricultural areas. Logging roads, landings, gravel pits, helipads, fireponds, and other structures used in managing the forest resource are not considered developments.

Primary agriculture--The primary agriculture class includes areas of intensive agriculture or areas of agricultural use intermingled with parcels of forest (fig. 2). These are defined as:

1. Tracts of cropland or pastureland 640 acres or larger with no more than eight developments per section.
2. Areas of forest intermingled with parcels of cropland or pastureland. Roads are generally 1/2 mile or more apart.

Low-density urban--Low-density urban includes forest or agricultural land with more than eight developments per section. Most strip development and rural commercial centers (**gas** station, store, post office) would fall into this dominant use class (fig. 3). Subdivisions with lot sizes greater than 1 acre would be included in this class.

Urban--The urban classification includes all land within legal boundaries of incorporated cities and towns as determined by boundaries shown on quadrangle maps or orthophotos. It also includes all land within areas developed for residential or industrial use as evidenced by roads, developed building sites, and structures. The road pattern (distance between parallel roads) in this zone is less than 1/4 mile (**fig. 4**). **This** class includes:

1. Subdivided areas of at least 40 acres. City road patterns and closely spaced buildings are indicators of the urban dominant use class.
2. Forested land within 1/4 mile of urban land. An example is Forest Park near Portland.

A schematic showing the decision process aerial photographic interpreters used to identify the dominant use classes **is** as follows :

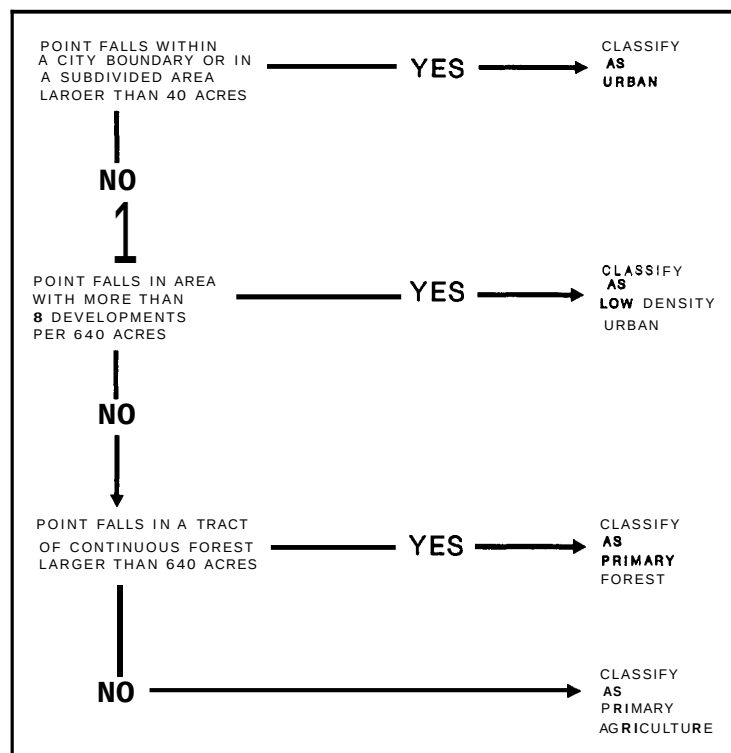




Figure 1--Primary forest dominant use class.



Figure 2--Primary agriculture dominant use class.

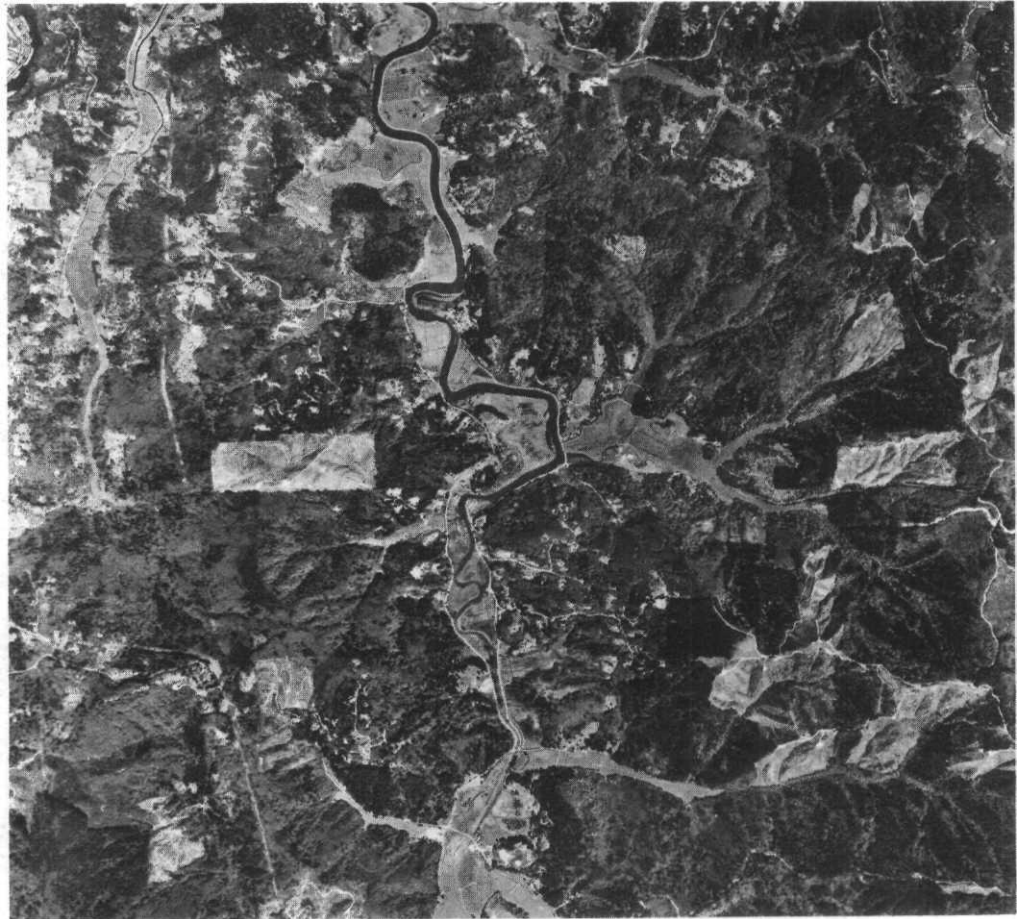


Figure 3--Low-density urban dominant use class.



Figure 4-Urban **dominant use class.**

RESULTS

The distribution of dominant use classes in western Oregon based on 1982 aerial photography is shown in figure 5.¹

In 1982, western Oregon had 388,053 acres of land classified in the urban dominant use class. When Forest Service and Bureau of Land Management lands are excluded, this is 3.5 percent of the total remaining land area in western Oregon (table 1). In 1972-74 this same use class occupied 342,648 acres or 3.1 percent of the total non-Federal lands in western Oregon. This urban land area increased by about 5,074 acres per year (fig. 6 and table 2). Counties with the greatest increase in urban development were Washington, Clackamas, and Lane (county names are shown in fig. 7).

Land classified as being low-density urban increased to 707,125 acres in 1982 from 625,700 acres in 1971-74. Land in the low-density urban class currently represents 6.5 percent of the total non-Federal land in western Oregon. This class increased by 8,629 acres per year. The largest increases occurred in Marion, Multnomah, Coos, Linn, and Lane Counties. Most of the increase came from primary agriculture except in Coos and Lane Counties where it came from primary forest.

Land in the primary agriculture class decreased from 3,772,663 acres in 1971-74 to 3,709,121 acres in 1982. The primary agriculture class is 33.9 percent of the total non-Federal land in western Oregon. This class decreased on the average by 7,008 acres per year. The largest decreases occurred in Washington, Marion, Multnomah, and Linn Counties with most of these lands going to low-density urban; in Washington County most went to the urban use class.

More than half (56 percent) of all non-Federal land in western Oregon in 1982 was in the primary forest class. The 6,132,158 acres in this class decreased 1 percent from the 6,195,446 acres identified as being in this class in 1971-74. The annual rate of loss from primary forest to other use classes was 6,694 acres. Counties with the highest annual acreage loss in primary forest included Lane, Douglas, Lincoln, and Coos. Every county in western Oregon, except Polk and Clatsop, had a decrease in the primary forest class. In several counties the loss was less than 300 acres per year.

¹To complete the map shown in figure 5, National Forests and Bureau of Land Management lands were arbitrarily classed as primary forest.

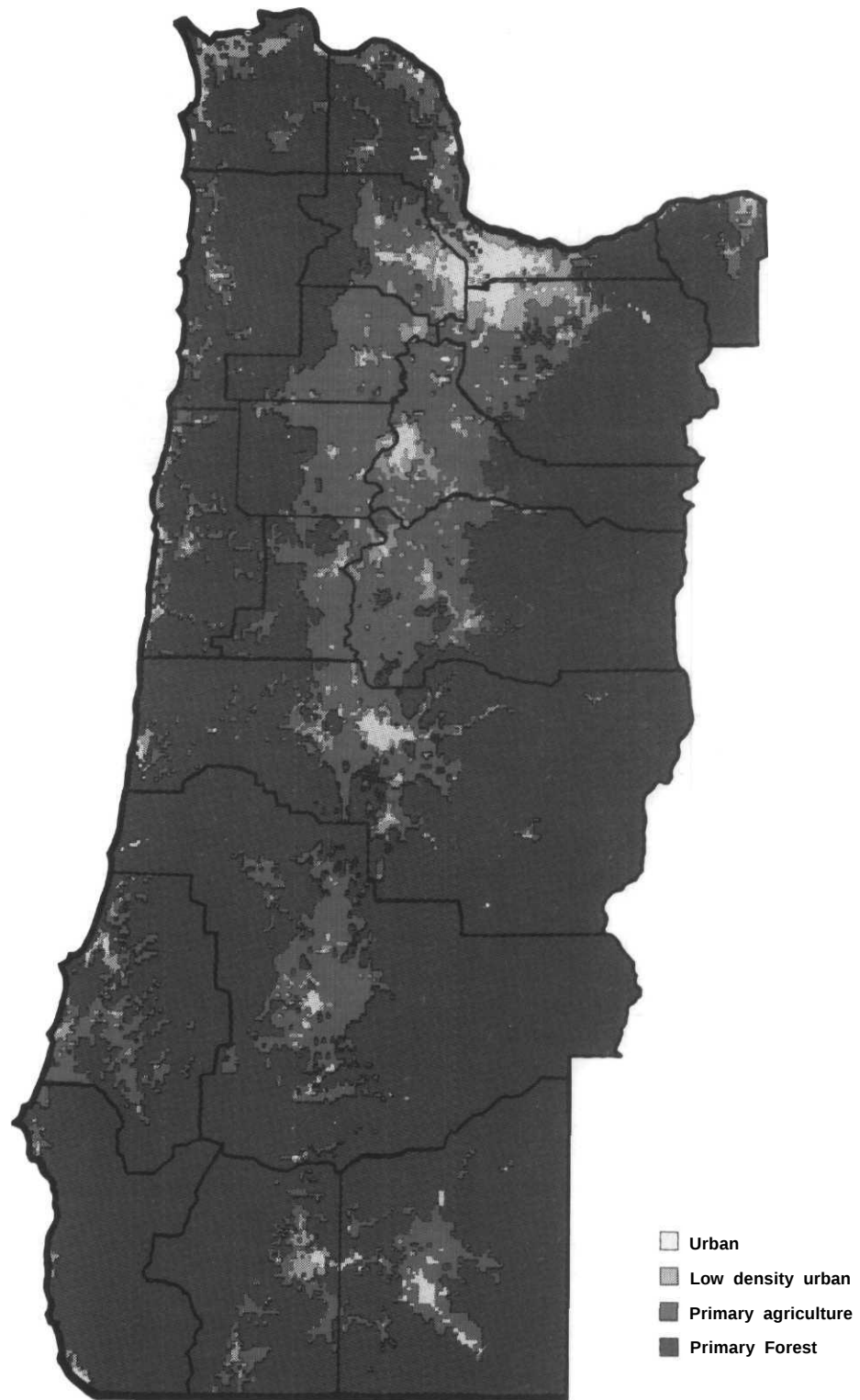


Figure 5—Dominant use classes
in western Oregon, 1982.

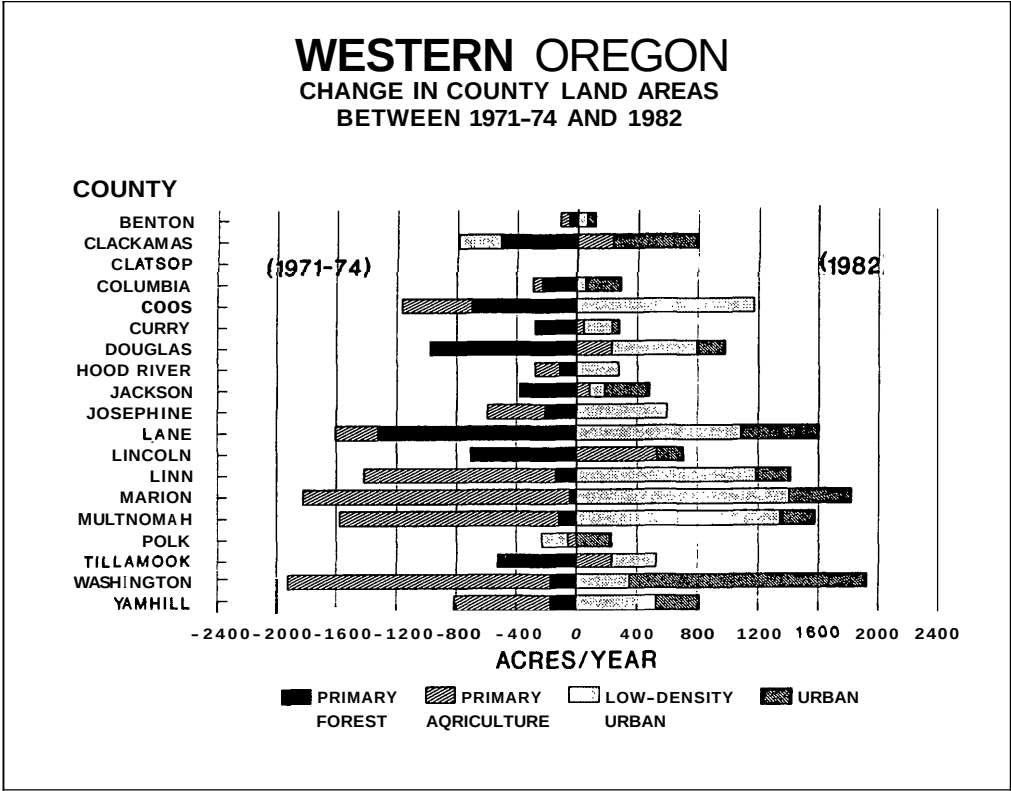


Figure 6--Changes in dominant use classes
in western Oregon between 1971-74 and 1982.

Table 1--Area of non-Federal lands in western Oregon acres by county, date of photography, and dominant use classes showing changes between 1971-74 and 1982^a

County and dominant use class	Year and acres	1982			
		Primary forest	Primary agriculture	Low-density urban	Urban
		Acres			
Benton :	1974				
Primary forest	121,255	120,783	472	--	--
Primary agriculture	215,616	--	214,672	944	--
Low-density urban	15,570	--	--	15,098	472
Urban	6,134	--	--	--	6,134
Total	358,575	120,783	215,144	16,042	6,606
Clackamas :	1972				
Primary forest	197,082	191,945	3,269	934	934
Primary agriculture	239,114	--	238,180	--	934
Low-density urban	98,541	--	--	94,805	3,736
Urban	50,905	--	--	--	50,905
Total	585,642	191,945	241,449	95,739	56,509
Clatsop :	1974				
Primary forest	402,570	402,570	--	--	--
Primary agriculture	50,438	--	50,438	--	--
Low-density urban	46,235	--	--	46,235	--
Urban	9,807	--	--	--	9,807
Total	509,050	402,570	50,438	46,235	9,807
Columbia :	1974				
Primary forest	243,784	241,916	1,868	--	--
Primary agriculture	147,569	--	145,234	467	1,868
Low-density urban	1,868	--	--	1,868	--
Urban	14,012	--	--	--	14,012
Total	407,233	241,916	147,102	2,335	15,880
Coos :	1972				
Primary forest	532,479	525,466	3,273	3,740	--
Primary agriculture	201,490	--	193,543	7,947	--
Low-density urban	26,647	--	--	26,647	--
Urban	7,012	--	--	--	7,012
Total	767,628	525,466	196,816	38,334	7,012

Table 1--Area of non-Federal lands in western Oregon acres by county, date of photography, and dominant use classes showing changes between 1971-74 and 1982^a--Continued

County and dominant use class	Year and acres	1982			
		Primary forest	Primary agriculture	Low-density urban	Urban
		<u>Acres</u>			
Curry :	1972				
Primary forest	311,353	308,547	468	2,338	--
Primary agriculture	14,025	--	14,025	--	--
Low-density urban	9,350	--	--	8,882	468
Urban	5,143	--	--	--	5,143
Total	339,871	308,547	14,493	11,220	5,611
Douglas :	1972				
Primary forest	1,064,021	1,054,204	9,817	--	--
Primary agriculture	466,561	--	459,081	7,012	468
Low-density urban	21,038	--	--	19,635	1,403
Urban	15,427	--	--	--	15,427
Total	1,567,047	1,054,204	468,898	26,647	17,298
Hood River:	1974				
Primary forest	75,190	74,256	934	--	--
Primary agriculture	30,723	--	28,488	2,235	--
Low-density urban	12,610	--	--	12,610	--
Urban	934	--	--	--	934
Total	119,457	74,256	29,422	14,845	934
Jackson :	1971				
Primary forest	619,433	615,225	3,273	--	935
Primary agriculture	210,841	--	208,503	--	2,338
Low-density urban	1,870	--	--	1,870	--
Urban	32,725	--	--	--	32,725
Total	864,869	615,225	211,776	1,870	35,998
Josephine:	1971				
Primary forest	156,144	153,806	935	1,403	--
Primary agriculture	128,095	--	122,952	5,143	--
Low-density urban	31,789	--	--	31,789	--
Urban	4,675	--	--	--	4,675
Total	320,703	153,806	123,887	38,335	4,675

Table 1--Area of nonoFederal lands in western Oregon acres by county, date of photography, and dominant use classes showing changes between **1971-74** and **1982^a**--Continued

County and dominant use class	Year and acres	1982			
		Primary forest	Primary agriculture	Low-density urban	Urban
		Acres			
Lane :	1972				
Primary forest	730,830	717,618	9,908	2,831	473
Primary agriculture	359,046	--	346,306	12,267	473
Low-density urban	75,961	--	--	71,715	4,246
Urban	48,596	--	--	--	48,596
Total	1,214,433	717,618	356,214	86,813	53,788
Lincoln:	1974				
Primary forest	327,906	322,244	4,718	944	--
Primary agriculture	66,525	--	66,053	472	--
Low-density urban	25,005	--	--	23,590	1,415
Urban	11,795	--	--	--	11,795
Total	431,231	322,244	70,771	25,006	13,210
Linn:	1972				
Primary forest	387,825	386,410	1,415	--	--
Primary agriculture	469,448	--	455,294	14,154	--
Low-density urban	48,124	--	--	45,765	2,359
Urban	4,718	--	--	--	4,718
Total	910,115	386,410	456,709	59,919	7,077
Marion :	1972				
Primary forest	95,739	95,272	--	467	--
Primary agriculture	356,335	--	338,588	17,747	--
Low-density urban	56,509	--	--	52,306	4,203
Urban	22,417	--	--	--	22,417
Total	531,000	95,272	338,588	70,520	26,620
Multnomah :	1974				
Primary forest	33,625	32,691	--	934	--
Primary agriculture	50,906	--	39,230	11,676	--
Low-density urban	49,971	--	--	48,103	1,868
Urban	58,377	--	--	--	58,377
Total	192,879	32,691	39,230	60,713	60,245

Table 1--Area of non-Federal lands in western Oregon acres by county, date of photography, and dominant use classes showing changes between 1971-74 and 1982^a--Continued

County and dominant use class	Year and acres	1982			
		Primary forest	Primary agriculture	Low-density urban	Urban
		Acres			
Polk:	1974				
Primary forest	156,918	156,918	--	--	--
Primary agriculture	249,408	--	248,941	467	--
Low-density urban	14,945	--	--	13,077	1,868
Urban	4,670	--	--	--	4,670
Total	425,941	156,918	248,941	13,544	6,538
Tillamook :	1974				
Primary forest	485,700	481,497	2,335	1,868	--
Primary agriculture	49,037	--	48,570	467	--
Low-density urban	7,939	--	--	7,939	--
Urban	4,670	--	--	--	4,670
Total	547,346	481,497	50,905	10,274	4,670
Washington:	1978				
Primary forest	160,655	159,254	1,401	--	--
Primary agriculture	198,016	--	182,604	13,544	1,868
Low-density urban	53,707	--	--	42,966	10,741
Urban	36,428	--	--	--	36,428
Total	448,806	159,254	184,005	56,510	49,037
Yamhill :	1974				
Primary forest	92,937	91,536	1,401	--	--
Primary agriculture	269,470	--	262,932	5,604	934
Low-density urban	28,021	--	--	26,620	1,401
Urban	4,203	--	--	--	4,203
Total	394,631	91,536	264,333	32,224	6,538
Western Oregon:	1971-74				
Primary forest	6,195,446	6,132,158	45,487	15,459	2,342
Primary agriculture	3,772,663	--	3,663,634	100,146	8,883
Low-density urban	625,700	--	--	591,520	34,180
Urban	342,648	--	--	--	342,648
Total, all counties	10,936,457	6,132,158	3,709,121	707,125	388,053

^aTotals may be off because of rounding.

Table 2--Summary of **changes in dominant use classes** on non-Federal land by county in western Oregon between 1971-74 and 1982

County and dominant use class	Date of photography and acres		Total acreage change	Ratio of change	Change/year
	- - - - - Acres - - - - -				Acres
Benton:	1974	1982			
Primary forest	121,255	120,783	-472	0.9961	-59
Primary agriculture	215,616	215,144	-472	.9978	-59
Low-density urban	15,570	16,042	472	1.0303	59
Urban	6,134	6,606	472	1.0769	59
Total	358,575	358,575			
Clackamas :	1972	1982			
Primary forest	197,082	191,945	-5,137	.9739	-514
Primary agriculture	239,114	241,449	2,335	1.0098	234
Low-density urban	98,541	95,739	-2,802	.9716	-280
Urban	50,905	56,509	5,604	1.1101	560
Total	585,642	585,642			
Clatsop :	1974	1982			
Primary forest	402,570	402,570	0	1.0000	--
Primary agriculture	50,438	50,438	0	1.0000	--
Low-density urban	46,235	46,235	0	1.0000	--
Urban	9,807	9,807	0	1.0000	--
Total	509,050	509,050			
Columbia:	1974	1982			
Primary forest	243,784	241,916	-1,868	.9923	-234
Primary agriculture	147,569	147,102	-467	.9968	-58
Low-density urban	1,868	2,335	467	1.2500	58
Urban	14,012	15,880	1,868	1.1333	234
Total	407,233	407,233			
coos :	1972	1982			
Primary forest	532,479	525,466	-7,013	.9868	-701
Primary agriculture	201,490	196,816	-4,674	.9768	-467
Low-density urban	26,647	38,338	11,691	1.4387	1,169
Urban	7,012	7,012	0	1.0000	--
Total	767,628	767,632			

Table 2--Summary of changes in dominant use classes on non-Federal land by county in western Oregon between 1971-74 and 1982^a--Continued

County and dominant use class	Date of photography and acres		Total acreage change	Ratio of change	Change/year
	- - - - - Acres - - - - -				Acres
Curry :	1972	1982			
Primary forest	311,353	308,547	-2,806	.9910	-281
Primary agriculture	14,025	14,493	468	1.0334	47
Low-density urban	9,350	11,220	1,870	1.2000	187
Urban	5,143	5,611	468	1.0910	47
Total	339,871	339,871			
Douglas :	1972	1982			
Primary forest	1,064,021	1,054,204	-9,817	.9908	-982
Primary agriculture	466,561	468,898	2,337	1.0050	234
Low-density urban	21,038	26,647	5,609	1.2666	561
Urban	15,427	17,298	1,871	1.1213	187
Total	1,567,047	1,567,047			
Hood River:	1974	1982			
Primary forest	75,190	74,256	-934	.9876	-117
Primary agriculture	30,723	29,422	-1,301	.9577	-163
Low-density urban	12,610	14,845	2,235	1.1772	279
Urban	934	934	0	1.0000	--
Total	119,457	119,457			
Jackson :	1971	1982			
Primary forest	619,433	615,225	-4,208	.9932	-383
Primary agriculture	210,841	211,776	935	1.0044	85
Low-density urban	1,870	1,870	0	1.0000	--
Urban	32,725	35,998	3,273	1.1000	298
Total	864,869	864,869			
Josephine:	1971	1982			
Primary forest	156,144	153,806	-2,338	.9850	-213
Primary agriculture	128,095	123,887	-4,208	.9671	-383
Low-density urban	31,789	38,335	6,546	1.2059	595
Urban	4,675	4,675	0	1.0000	--
Total	320,703	320,703			

Table 2--Summary of changes in dominant use classes on non-Federal land by county in western Oregon between 1971-74 and 1982^a--Continued

County and dominant use class	Date of photography and acres		Total acreage change	Ratio of change	Change/year
	- - - - - Acres - - - - -				Acres
Lane :	1972	1982			
Primary forest	730,830	717,618	-13,212	.9819	-1321
Primary agriculture	359,046	356,214	-2,832	.9921	-283
Low-density urban	75,961	86,813	10,852	1.1429	1085
Urban	48,596	53,788	5,192	1.1068	519
Total	1,214,433	1,214,433			
Lincoln :	1974	1982			
Primary forest	327,906	322,244	-5,662	.9827	-708
Primary agriculture	66,525	70,771	4,246	1.0638	531
Low-density urban	25,005	25,006	1	1.0000	--
Urban	11,795	13,210	1,415	1.1200	177
Total	431,231	431,231			
Linn:	1972	1982			
Primary forest	387,825	386,410	-1,415	.9964	-142
Primary agriculture	469,448	456,709	-12,739	.9729	-1274
Low-density urban	48,124	59,919	11,795	1.2451	1180
Urban	4,718	7,077	2,359	1.5000	236
Total	910,115	910,115			
Marion:	1972	1982			
Primary forest	95,739	95,272	-467	.9951	-47
Primary agriculture	356,335	338,588	-17,747	.9502	-1775
Low-density urban	56,509	70,520	14,011	1.2479	1401
Urban	22,417	26,620	4,203	1.1875	420
Total	531,000	531,000			
Multnomah :	1974	1982			
Primary forest	33,625	32,691	-934	.9722	-117
Primary agriculture	50,906	39,230	-11,676	.7706	-1,460
Low-density urban	49,971	60,713	10,742	1.2150	1,343
Urban	58,377	60,245	1,868	1.0320	234
Total	192,879	192,879			

Table 2--Summary of changes in dominant use classes on non-Federal land by county in western Oregon between 1971-74 and 1982^a

County and dominant use class	Date of photography and acres		Total acreage change	Ratio of change	Change/year
	- - - - - Acres - - - - -				Acres
Polk:	1974	1982			
Primary forest	156,918	156,918	0	1.0000	--
Primary agriculture	249,408	248,941	-467	.9981	-58
Low-density urban	14,945	13,544	-1,401	.9063	-175
Urban	4,670	6,538	1,868	1.4000	234
Total	425,941	425,941			
Tillamook:	1974	1982			
Primary forest	485,700	481,497	-4,203	.9913	-525
Primary agriculture	49,037	50,905	1,868	1.0381	234
Low-density urban	7,939	10,274	2,335	1.2941	292
Urban	4,670	4,670	0	1.0000	--
Total	547,346	547,346			
Washington:	1974	1982			
Primary forest	160,655	159,254	-1,401	.9913	-175
Primary agriculture	198,016	184,005	-14,011	.9292	-1751
Low-density urban	53,707	56,510	2,803	1.0522	350
Urban	36,428	49,037	12,609	1.3461	1,576
Total	448,806	448,806			
Yamhill:	1974	1982			
Primary forest	92,937	91,536	-1,401	.9849	-175
Primary agriculture	269,470	264,333	-5,137	.9809	-642
Low-density urban	28,021	32,224	4,203	1.1500	525
Urban	4,203	6,538	2,335	1.5556	292
Total	394,631	394,631			
Western Oregon:	1971-74	1982			
Primary forest	6,195,446	6,132,158	-63,288	.9898	-6,694 ^b
Primary agriculture	3,772,663	3,709,121	-63,542	.9832	-7,008 ^b
Low-density urban	625,700	707,125	81,425	1.1301	8,629 ^b
Urban	342,648	388,053	45,405	1.1325	5,074 ^b
Total	10,936,457	10,936,457			

^aTotals may be off because of rounding.

^bSum of individual county change/year.

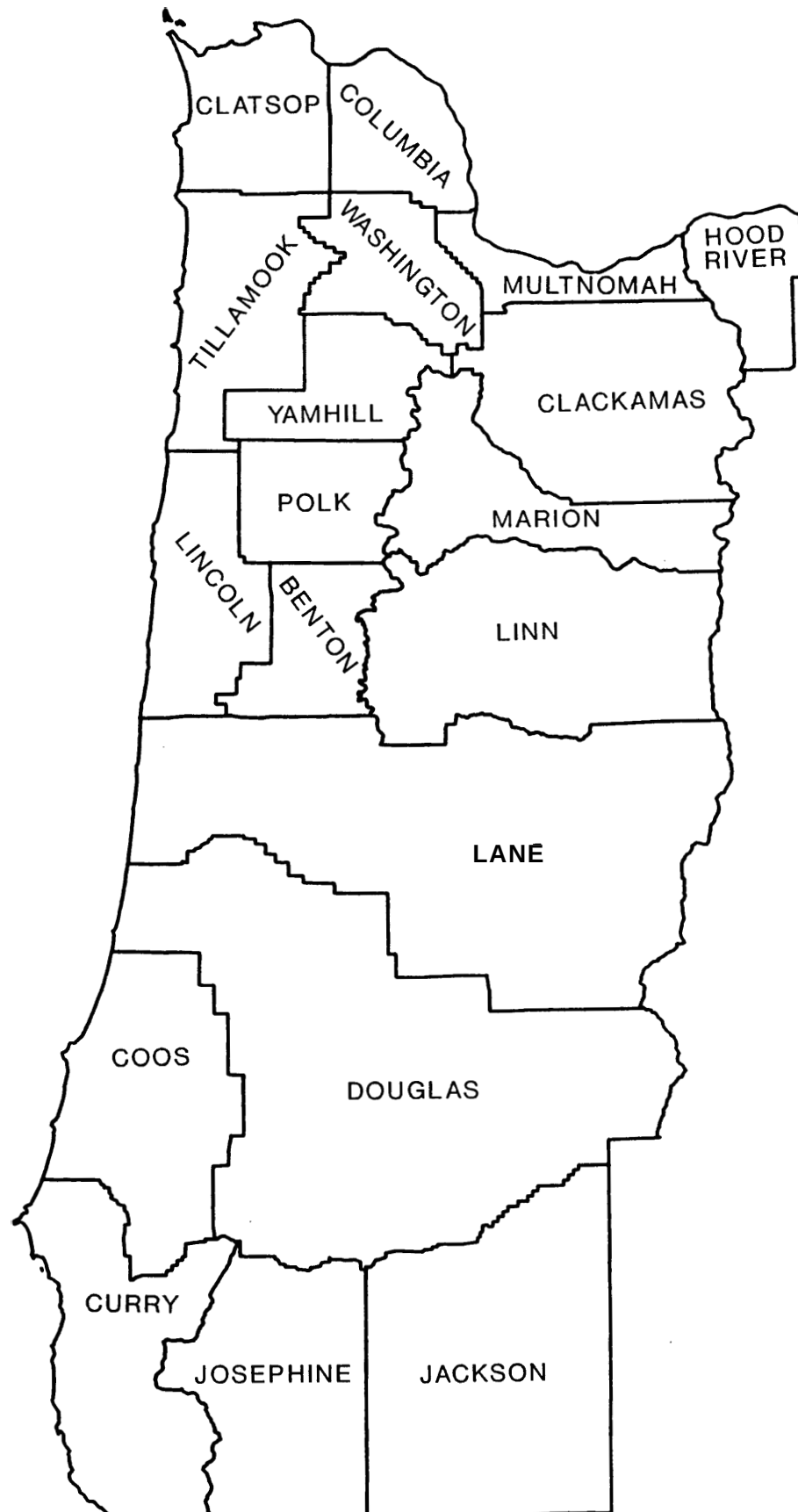


Figure 7--The counties of western Oregon.

RELIABILITY OF DATA

All area statistics for non-Federal areas are based on sampling and are subject to sampling error (Cochran 1977). Confidence intervals are quantitative expressions of the reliability of the area statistics and they vary by the size of the item being estimated. The following tabulation approximates confidence bounds for area estimates of various sizes in this report:

<u>Area</u>	<u>Confidence interval</u>
	<u>Acres</u>
1,000	± 683
5,000	$\pm 1,527$
10,000	$\pm 2,159$
50,000	$\pm 4,804$
100,000	$\pm 6,752$
200,000	$\pm 9,430$
400,000	$\pm 12,995$

Confidence intervals are quantitative expressions of the reliability of the area estimates. The above tabulation, for instance, indicates a two-in-three (68-percent) chance that the area estimate of 5,000 acres is within a range of 5,000 acres $\pm$ 1,527 (3,473 to 6,527) acres.

FUTURE PLANS

The next planned inventory of western Oregon by the Forest Inventory and Analysis Unit is to be completed in 1996. At that time, another appraisal will be made of changes in land use. This will provide a 25-year evaluation of the trends in use of western Oregon's land.

The Forest Inventory and Analysis Unit in Portland also has responsibility for inventories of Washington and California. Similar studies of both the current situation and trends in land use are being conducted in those States. Upon completion of the western Washington inventory in 1989 and the California inventory in 1993-94, data on changes over time will be available for those States.

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Statistics are presented by county for western Oregon for five dominant land use classes on non-Federally owned land. The classes were primary forest, primary agriculture, low-density urban, and urban. Classes were determined from aerial photographs taken in 1971-74 and in 1982; by using these data, data on changes for the period between photography were developed.

Keywords: Land use, land use change, resource use, land allocation, Oregon (western).

The Forest Service of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.

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